IntesisBox®

DK-AC-ENO-1 v.1.0.4

DK-AC-ENO-1C v.1.0.4

EnOcean Interface for Daikin air conditioners.
Compatible with Domestic lines

User's Manual

v1 r4 eng

Reference: **DK-AC-ENO-1 / 1C**
Issue Date: 18/10/2010

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1. Presentation

DK-AC-ENO-1 and DK-AC-ENO-1C devices allow a complete and natural integration of Daikin air conditioners with EnOcean control systems both in their 868 MHz (DK-AC-ENO-1) and 315 MHz (DK-AC-ENO-1C) versions.

Compatible with all models of Domestic lines commercialized in Europe (FTXR, CTXU, FTXG, FTXS, FVXS, FLXS and FDXS. Check Table 8.1).

1.1. *Main Features:*

- Reduced dimensions.
- Quick installation.
- External power not required.
- Direct connection to the Daikin AC indoor unit.
- Fully EnOcean interoperable.
- Multiple profiles
- Control of the AC unit based in the ambient temperature read by the own AC unit, or in the ambient temperature read by any EnOcean thermostat.
- Total Control and Monitoring of the AC unit from EnOcean, including monitoring of AC unit's state of internal variables, and error indication and error code.
- AC unit can be controlled simultaneously by the IR remote control of the AC unit and by EnOcean devices.
- Implements the newly approved HVAC EEP's
- Advanced room control functionalities.

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1.2. *Typical Application*

In Figure 1.1 it is shown a typical application of DK-AC-ENO-1 / 1C in a hotel room. The different devices that control the A.C unit, like switches, Key cards, window contacts, are connected to it through the DK-AC-ENO-1 / 1C.

BMS
KNX, DALI, LON, BACnet,TCP/IP
Gateway / Room Controller
Direct Control
• Enocean standard communication
• Small Dimensions
• Fast Installation
• No external PS
• Several Profiles
• Direct connection to AC unit
HVAC APPLICATION
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enocean
1 Batteryless wireless switches control lighting and/or A.C
2 Key card switch controls access to a room and turns on A.C and lighting when entering a room.
3 A.C. Unit connected to ME-AC-ENO-1 / 1C
4 Room temperature sensor
5 Climatic sensors
6 7 Position sensors – window handle and window contact –cut out heating and air-conditioning when windows are open.
8 Central control
9 DK-AC-ENO-1 / 1C

Figure 1.1 Typical application of DK-AC-ENO-1 / 1C in a hotel

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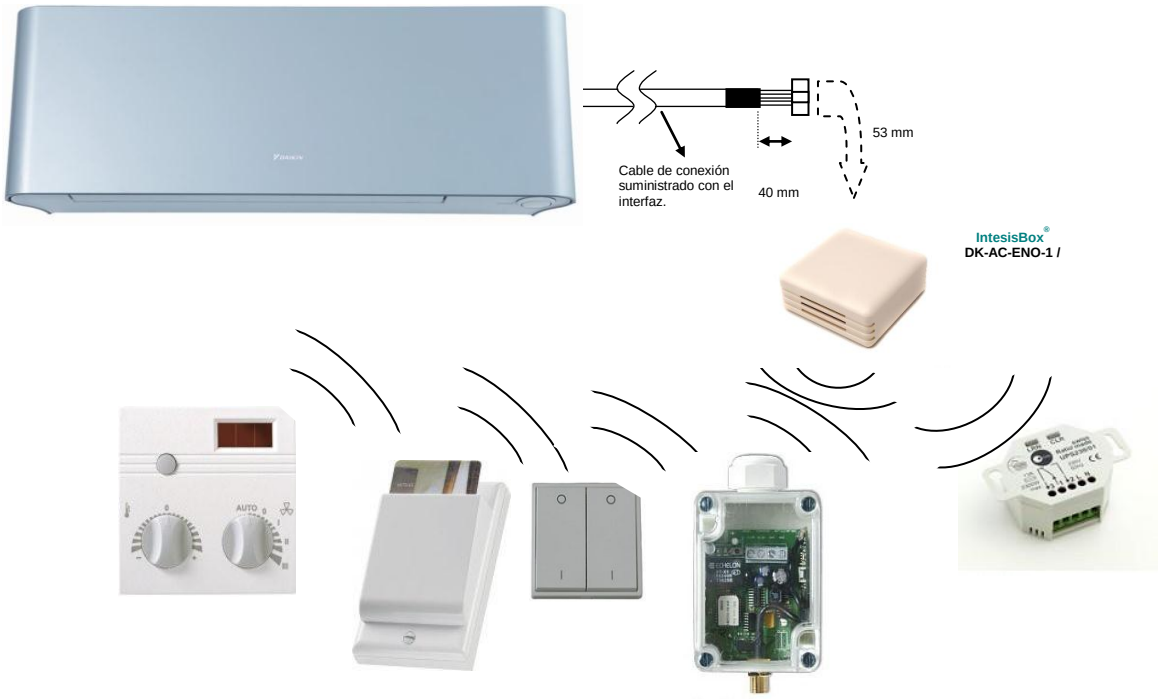
A schematic view of what it could be the application shown in Figure 1.1 can be seen in Figure 1.2. The connection diagram of the A.C with the DK-AC-ENO-1 / 1C and some of the supported EnOcean devices are shown



Dispositivos transmisores EnOcean típicos

- Termostatos
- Pulsadores
- Lectores de Tarjetas
- Contactos de ventana

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.
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Dispositivos receptores EnOcean típicos:

- Actuadores
- Pasarelas

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Figure 1.2 Example of DK-AC-ENO-1 / 1C control or actuation devices

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2. Connection and placement

2.1. *Connection*

Disconnect mains power from the AC unit. Open the front cover of the indoor unit in order to have access to the internal control board. In the control board locate the socket connector marked as:

S21 in Domestic line models

Using the cable that comes with the interface, insert one of its connectors, the biggest one, into the socket of the DK-AC-ENO-1 / 1C, and the other connector, the one installed in the largest uncovered part, to the socket **S21** of the AC unit's electronic circuit. Close the AC indoor unit's front cover again.

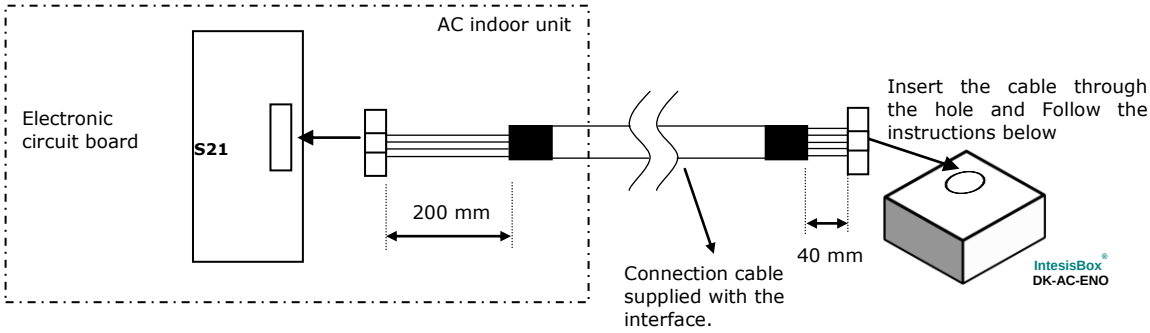

Figure 2.1 Device connection diagram

Important: Extending or shortening the length of connection cable included with the interface may cause it to malfunction.

To connect the device to the AC, the recommended methods are the ones in Figure 2.2

- Method1: The lead hole is place above CON1 (Figure 2.2 or Figure 3.1)
- Method2: The lead hole is placed on the opposite side. Use the supplied staple to fix the cable to the screw used for wall fixing.

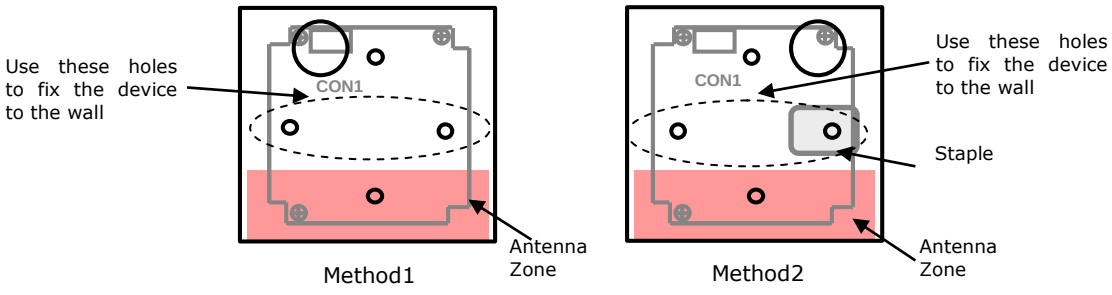

Figure 2.2 Connection methods

Important: The cable should not be placed on top or the antenna zone (area marked in Figure 2.2) as the performance of the device might be affected. For this same reason never use a metallic screw in the subjection hole on top of this antenna zone.

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2.2. *Placement*

The DK-AC-ENO-1 / 1C interface antenna has a better sensibility when the device is placed vertically, and therefore this is the preferred position when placed (antenna zone should be located in the bottom side, floor side, once the device is fixed to the wall).

The coverage distance (see Table 2.1) of the signal emitted by the DK-AC-ENO-1 / 1C, or by any other EnOcean device, is determined by the room geometry and where they are placed. As an example, long narrow corridors with wide walls are an adverse situation. People or other obstacles can reduce the coverage distance too. Is therefore advice to always think in the worst possible scenario to decide the placement of the device to ensure a good stability in the radio system.

Coverage distance	Conditions
< 30 m	Under ideal conditions: Broad room, no obstacles, good antenna design and good antenna positions.
< 20 m	The room is filled with furniture and people And penetration through up to 5 dry walls or up to 2 brick walls or up to 2 aero concrete walls
< 10 m	Identical to the previous case but the receiver is placed to a room corner or range along a narrow floor.
< 1 m	Metal-reinforced ceilings at upright penetration angle (in strong dependence of reinforcement density and antenna positions).

Table 2.1 Device coverage distance

2.2.1 Screening zones

It is important not to place the device in a place where the airwaves must go through a metallic object as they create a screening zone where the receivers are not going to be able to receive the EnOcean telegrams. This situation is shown in Figure 2.3a.

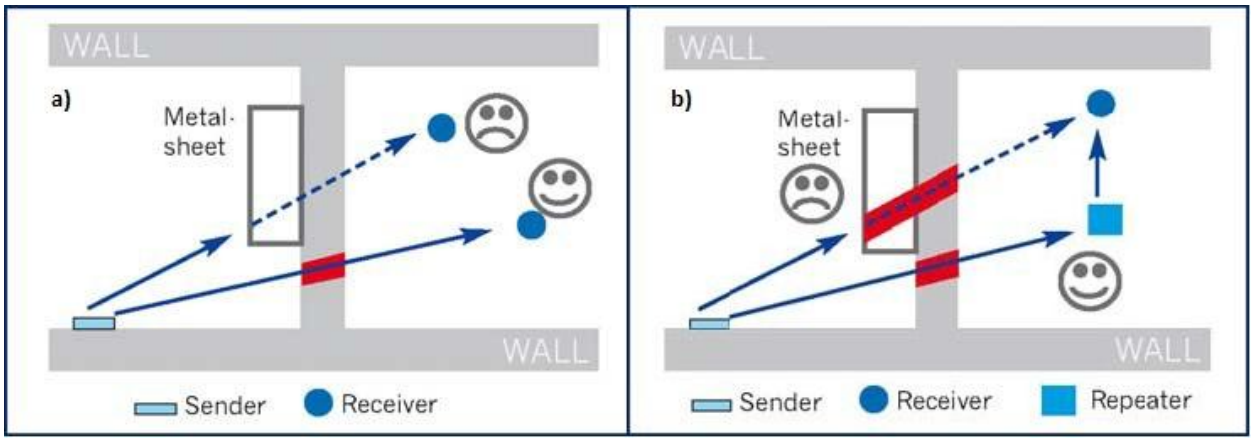

Figure 2.3 a) Screening zone b) solution with a repeater

The situation of one of the receivers doesn't allow it to receive the transceiver telegrams. To solve this situation the use or a repeater outside the screening zone (Figure 2.3b) is recommended. The telegrams will be retransmitted from there to the receiver

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2.2.2 Penetration Angle

This is the angle in which the airwaves reach a certain object they need to go through. The transmission to the other side of the object would be better as this angle gets closer to 90 º, being this the best transmission situation

In Figure 2.4a it is shown a receiver in a situation where the penetration angle is too close to 0º. The solution to that problem can be seen in Figure 2.4b using a repeater in a different position

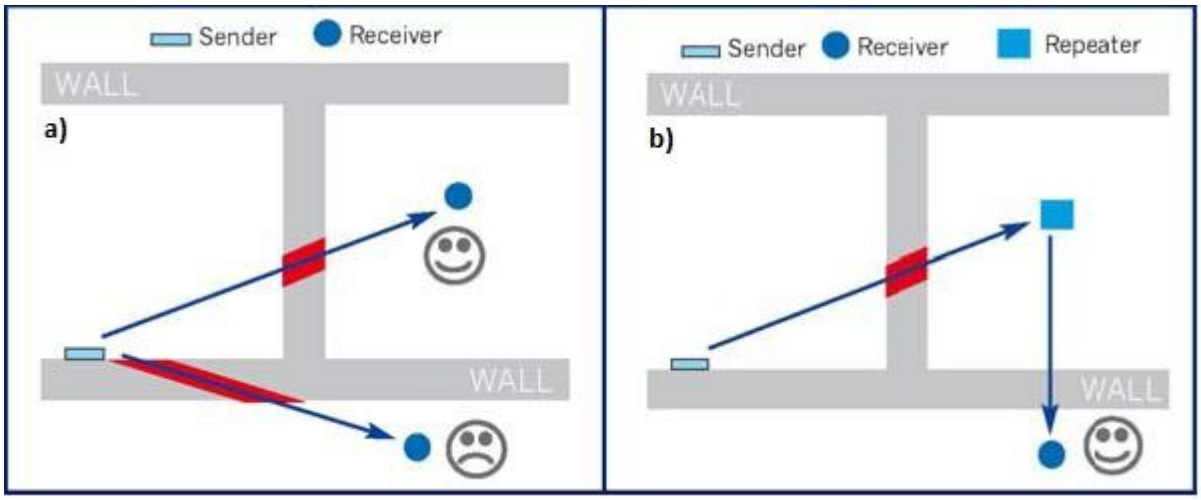

Figure 2.4 Penetration angle

2.2.3 Distance between Receiver and sources of interference

The distance between EnOcean receivers, as it is the DK-AC-ENO-1 /1C, and other transmitters (e.g. GSM / DECT / wireless LAN) or high frequency sources of interference (computers, audio and video equipment) should be higher than 50 centimeters.

However, EnOcean transmitters can be installed next to any other high-frequency transmitters without any problem.

2.2.4 Use of repeaters

In case of a poor radio reception, it may be helpful to use a repeater. EnOcean repeaters do not require any configuration, only a line-power supply is needed. A poor radio signal is received, refreshed and transmitted again, so nearly a double radio range can be achieved. Special EnOcean repeaters which can be switched to 2-level function allow two repeaters to be cascaded.

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3. Configuration

The DK-AC-ENO-1 / 1C (Figure 3.1) has two switches, a button and a profile selector to execute the Learning and Teach-in procedures from the EnOcean technology (explained in Table 3.1 and the following sections)

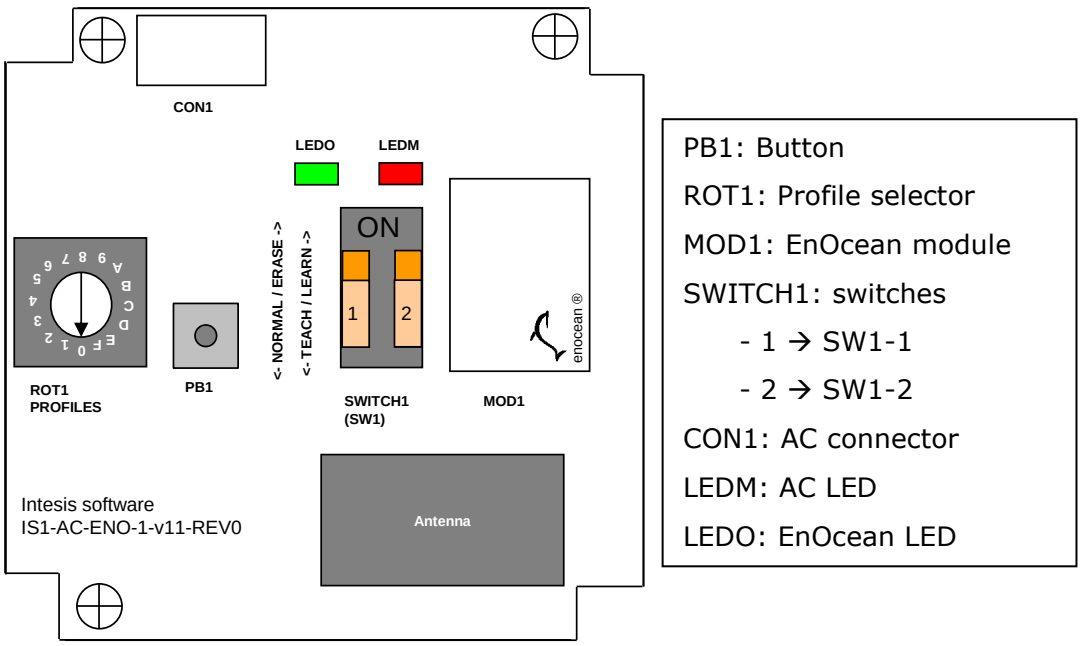

Figure 3.1 Device diagram

The switches in SW1 configure the behavior of the interface. The different working modes are explained in Table 3.1.

Mode	Switch 1 (SW1-1)	Switch 2 (SW1-2)	EnOcean LED state	Button PB1 function
Normal operation / Teach-in	Off	Off	Off	Send a Teach-in telegram or activate monitor mode (pressing it during 5 seconds)
EnOcean transmission disabled. Only allows Teach-in	Off	On	Off	Send a Teach-in telegram or activate monitor mode (pressing it during 5 seconds)
Learning	On	Off	On	No function
Erase	On	On	Flashing: 100 ms On / 100 ms Off	Delete the devices in the selected profile (pressing it during 5 seconds)

Table 3.1 Interface working modes.

Selector ROT1 it is used to select the desired profile. The transmission profile is used when the device is in Teach-in mode and the reception one when in Learning or erase mode.

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3.1. *Learning procedure*

The interface DK-AC-ENO-1 / 1C has, by default, 13 reception (Rx) profiles. In the factory configuration each Rx profile is assigned to a control signal of the Daikin AC indoor unit. The Learning procedure allows to link EnOcean devices to control the AC. Up to 5 devices can be linked to each profile (see exceptions in Table 3.2).The profiles are as follow:

Profile Index Rx (ROT1)	Signal	Allowed devices in profile
0	On/Off	5
1	Mode	5
2	Fan Speed	5
3	Vane position	N/A
4	Set point Temperature[1]	5
5	Ambient Temperature (virtual) [2]	1
6	Window contact	5
7	KEY CARD[3]	1
8	Occupancy sensor	5
9	Horizontal Swing	5
A	Vertical Swing	5
B a D	N/A	N/A
E	A.C profile	5
F	A.C profile[3]	5

Table 3.2 Default reception profiles

To **execute** the **Learning** procedure the next steps need to be followed. References to device components refer to Figure 3.1:

1. Set switch 1 (SW1-1) to ON position and switch 2 (SW1-2) to OFF. The EnOcean LED will be ON.

2. Set the profile selector (ROT1) in the desired position to link the EnOcean transmitters to the reception profile.

3. Push the Teach-in button of the devices that want to be linked, or if they don't have the Teach-in button (as the EnOcean switches) action them

4. When a valid EnOcean telegram is received the EnOcean LED turns off for 100 milliseconds and then it turns on again. The maximum linked devices in one profile is 5 (check Table 3.2 for special cases). Once this number is reached, no more devices are going to be linked to that profile. The EnOcean LED turns off when that happens.

5. Once the Learning procedure is finished set both SW1-1 and SW1-2 to off for a normal operation of the device. Once that is done the EnOcean LED turns off.

[1] When the Virtual temperature is turned on the set point temperature to be written to the AC unit is the virtual temperature instead of the Set point temperature.
[2] When a device is linked to either of these profiles the virtual temperature function is turned on automatically and the other is disabled so only one temperature reference can be linked. When no device linked it turns off.
[3] Only one device can be linked to this profile

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Profile Index Rx (ROT1)	Supported EEP
0	[05-02-xx] [05-03-xx] [06-00-01] [07-10-01] [07-10-02] [07-10-05]
1	[05-02-xx] [05-03-xx]
2	[05-02-xx] [05-03-xx] [07-10-01] [07-10-02] [07-10-04] [07-10-07] [07-10-08] [07-10-09]
4	[05-02-xx] [05-03-xx] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-0A] [07-10-10] [07-10-11] [07-10-12]
5	[07-02-05] [07-02-06] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-07] [07-10-08] [07-10-09] [07-10-0A] [07-10-0B] [07-10-0C] [07-10-0D] [07-10-10] [07-10-11] [07-10-12] [07-10-13] [07-10-14]
6	[05-02-xx] [05-03-xx] [06-00-01] [07-30-02]
7	[05-04-01]
8	[07-07-01] [07-08-01] [07-08-02]
9	[05-02-xx] [05-03-xx]
A	[05-02-xx] [05-03-xx]
E	[07-20-10] [07-10-03] [07-20-11][1]
F	[07-20-10] [07-10-03] [07-20-11][1]

Table 3.3 DK-AC-ENO-1 / 1C supported reception EEP

Important!

In Profiles E and F up to 5 devices can be linked. It needs to be taken into account that if the devices are working in Multiteach-in mode (more information in section 4.5) only one is going to be fully linked as it would take 3 of the 5 spaces available.

[1] HVAC Components (FUNC = 20) Generic HVAC interface (TYPE = 10 and 11) explained in section 7 and in EnOcean Equipment Profiles (EEP) and V2.1

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3.2. *Teach-in procedure*

The DK-AC-ENO-1 / 1C, as a transmitter device, has the Teach-in procedure implemented. With this procedure the AC can be linked to other EnOcean devices accepting the data send by the DK-AC-ENO.

There are several transmission profiles by default, with several AC signals assigned to them. The send data would contain the state of the AC signals specified in Table 3.4

Profile Index Tx (ROT1)	Transmission signals	EEP (EnOcean Profile)
0	On/Off	[05-02-01]
1	Alarm State	[05-02-01]
2	Set point Temperature	[07-02-05]
3	Ambient Temperature	[07-02-05]
4	Ambient Temperature, Set point Temperature, Fan Speed, On/Off	[07-10-01]
5	AC interface: Mode, fan speed, vane position, sensors and On/Off	[07-20-10]
6	Set point Temperature, Ambient Temperature	[07-10-03]
7	AC interface: AC Error code, Error state and disablements	[07-20-11]
8 to D	N/A	
E	All	[07-20-10][1] [07-10-03] [07-20-11]
F	All	[07-20-10][1] [07-10-03] [07-20-11]

Table 3.4 Signals linked to ROT1 **(Figure 3.1)**

To **execute** the **Teach-in** procedure:

1. Set the switches SW1-1 and SW1-2 to OFF
2. Set the profile selector (ROT1) to the desired transmission profile for the Teach-in procedure
3. Press PB1 to send a teach-in telegram. There must be a receiving in Learning mode for the linking to happen.

Remember that in this procedure the DK-AC-ENO-1 / 1C interface doesn't keep information from any of the devices.

Important!

In Profiles E and F three EEP's are sent pressing PB1 only once. These EEP's are sent with three different Base ID and therefore they behave in fact as 3 different devices. More information in section 4.5

[1] Multiteach-in process: The three EEp's are sent one after the other pressing the teach-in button only once.

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3.3. *Device deleting procedure*

To delete one or all the devices linked in one reception profile (Table 3.2) the device needs to be in ERASING mode. To do so follow the following lines (the references to device components are specified in Figure 3.1):

1. Set the profile selector (ROT1) to the desired reception profile where the device/s to be deleted are saved.

2. Set the switches SW1-1 and SW1-2 to ON. The EnOcen LED (LEDO) will turn into flashing (100 ms on and 100ms off)

3. Push the Teach-in button of the devices that want to be linked, or if they don't have the Teach-in button (as the EnOcean switches) action them. Once the telegram is received the EnOcean LED will be on for 1 second to show the device has been deleted from this profile.

4. Once finished, set the switches SW1-1 and SW1-2 to OFF for a normal operation of the device

A device can break down or be lost, and therefore the above mentioned delete procedure would not be possible to be executed. For that reason all the devices in one profile can be deleted. To do so follow the instructions (the references to device components are specified in Figure 3.1):

1. Set the profile selector (ROT1) to the desired reception profile.

2. Set the switches SW1-1 and SW1-2 to ON. The EnOcen LED (LEDO) will turn into flashing (100 ms on and 100ms off)

3. Press the button PB1 for 5 seconds. Once that is done the EnOcen LED (LEDO) will be on for 1 second to show that all devices in this profile have been deleted.

4. Once finished, set the switches SW1-1 and SW1-2 to OFF for a normal operation of the device

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4. Special Behaviors

In this section it is explained the special behavior of the DK-AC-ENO-1 / 1C when certain kinds of devices are used: Window contacts, thermostat with external temperature sensor, occupancy sensors and key card. The use of these sensors needs further explanation as the DK-AC-ENO-1 / 1C realizes special operations or assume previous states. All the explanations in these sections are related to the factory settings of the device.

4.1. *Window contact*

The DK-AC-ENO-1 / 1C has the functionality to automatically control the turning on and off of the AC indoor unit depending on the state of one or several (up to 5) EnOcean window contacts.

EnOcean window contacts periodically send its state and they do so too after a change in the window state happens.

When a window contact is associated to the DK-AC-ENO-1 / 1C interface it is assumed that the window is closed until the correct state of the window contact is received.

The AC indoor unit will be turned OFF and disabled if **any** of the window contacts linked to the window contact profile is sending a "window opened" message for a certain period of time (default value: 30 seconds). If the AC indoor unit is set to ON (either by an EnOcean device of by the remote control) the DK-AC-ENO-1 / 1C will set it back to OFF.

When all the window contacts are sending a "window closed" message, the AC indoor unit will go back to its previous state.

The functionality specified on the above lines would only be active when devices are linked in the window contact profile (Table 3.2).

The information about the states of the linked window contacts would be lost if there is a power down in the system, but it will restore itself in a brief period of time as the window contacts send their state periodically.

4.2. *External temperature Sensors. Virtual temperature*

This behavior is only activated when there is an external temperature device linked to either profile 5 or profile F. Once a device is linked to one of these profiles the other is going to be disabled as the AC unit can only work with one external temperature as a reference.

Three temperatures are involved:

- Set point temperature: It is the set point temperature sent to the AC unit (S)
- Virtual Set point temperature: It is the Set point temperature requested by the thermostat (S_v)
- Virtual Ambient temperature: It is the ambient temperature measured by the thermostat (T_v)

The Set point Temperature sent to the AC indoor unit is calculated with the following formula:

$$S = S_v - (T_v - S_v) / 2$$

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4.3. *Key Card*

Due to the way the Key Cards reader work there is a specific reception profile for it. In this profile (Table 3.2) it is only possible to link one device. If the linked device it is not a key card the correct behavior of the DK-AC-ENO-1/1C cannot be granted.

When inserting the Key card in the reader the A.C unit is enabled (becomes available to be turned on) but it stays OFF. A manual actuation of another device would be needed to turn it ON.

When the Key card is removed the A.C indoor unit is disabled and turned OFF staying in this state until we insert the Key Card again. If the AC indoor unit is set to ON (either by an EnOcean device of by the remote control) the DK-AC-ENO-1 / 1C will set it back to OFF.

The functionality specified on the above lines would only be active when devices are linked in the Key Card profile (Table 3.2).

The information about the state of the linked key card would be lost if there is a power down in the system. Therefore it would be needed to set the previous state by actuating the key card.

4.4. *Occupancy sensors*

The DK-AC-ENO-1 / 1C has the functionality to automatically control the behavior of the AC indoor unit depending on the state of one or several (up to 5) EnOcean Occupancy sensors.

When all the occupancy sensors linked to the device are not detecting any occupancy the DK-AC-ENO-1 will go to non-presence mode following these steps:

1. Wait a certain time period (default value: 10 minutes) where no action is performed.

2. When this time expires the temperature will change depending on the mode. If in Cool the set point would increase 2ºC and if in Heat would decrease 2ºC. If any other mode the set point temperature would not be changed.

3. This would last for a certain period of time (default value: 60 minutes) when the machine would be turned OFF.

If a presence is detected the system will work as follows:

1. If in step 1 or 2: go to the previous state.

2. If in Step 3: does nothing.

The information about the state of the linked Occupancy sensors would be lost if there is a power down in the system. It will recover as soon as a presence signal is received.

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4.5. *MultiTeach-in procedure*

AC units have a lot of parameters to control and supervise and with only one 4BS telegram all this information cannot be fitted in. For these reason the DK-AC-ENO-1 / 1C implements, besides standard teach-in, a MultiTeach-in procedure where more than one EEP is sent to be teach at the same time. In the next lines this procedure is going to be further explained.

This procedure is performed only when the profile selector (ROT1) is set to profiles E or F (the ones that implement the HVAC generic EEPs). The way it is implemented is simple. A different Base ID is assigned to each EEP and it is actually performing 3 consecutive teach-in procedures. This allows devices that support the 3 EEP's to automatically link them.

It needs to be taken into account that used in this profile the DK-AC-ENO-1 / 1C is working as if it was three different EnOcean devices at a time.

If this procedure is performed in the opposite way (the DK-AC-ENO-1 / 1C is in Learning mode in profile E or F) 3 devices positions would be taken, implying that only 1 device using MultiTeach-in would be able to be fully link in each profile. If tried again with another device only 2 of the different EEPs are going to be stored.

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5. Communications monitoring

The interface DK-AC-ENO-1 / 1C has two LEDs that show information about the operation of the device.

The green LED is associated to the EnOcean section, and the red LED to the Daikin Air Conditioner one (AC LED)

5.1. *AC communication monitoring mode (RED LED)*

In Table 5.1 it is shown how the AC LED (red) behaves and its meaning

Device state	LEDM (RED) state	ON / OFF Period	Meaning
Turning on	Pulse	On during 5 seconds	Reset or initialization process after start up
During normal operation	Flashing	200ms On 800ms Off	Communication error with A.C. unit
During normal operation	Flashing	1s On 1s Off	Error detected in A.C. unit
During normal operation	Off	-	Normal operation in the A.C communication

Table 5.1 Device estate and AC LED

5.2. *EnOcean communication monitoring mode (GREEN LED)*

Due to the transmitting method (radio) of EnOcean telegrams, the possibility that the DK-AC-ENO-1 /1C is outside the coverage range of one device is possible. For that reason, the interface, as a receiver, has the ability to show when it receives EnOcean telegrams from a linked device when in monitoring mode.

To **activate** the monitoring mode:

1. Set switches SW1-1 y SW1-2 to OFF
2. Press PB1 for 6 seconds. The EnOcean LED will briefly flash (100ms). From then on, the EnOcean LED will flash every time a valid EnOcean Telegram is received from a linked device to the DK-AC-ENO-1 /1C

To **disable** the monitoring mode:

1. Briefly push (less than 6 seconds) PB1

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6. Technical data and dimensions

The main features of the devices DK-AC-ENO-1 / 1C are shown in Table 6.1. For further detail check the DK-AC-ENO-1 / 1C datasheet

Dimensions	*71 x 71 x 27 mm*
Weight	*60 g*
Operating Temperature	*-25 . . . 85ºC*
Stock Temperature	*-40 . . . 85ºC*
Operating Humidity	*<93% HR, non-condensing*
Stock Humidity	*<93% HR, non-condensing*
Power requirements	12V, 35mA typical
EnOcean Frequencies	*DK-AC-ENO-1: 868 MHz* *DK-AC-ENO-1C: 315 MHz*

Table 6.1 Technical data

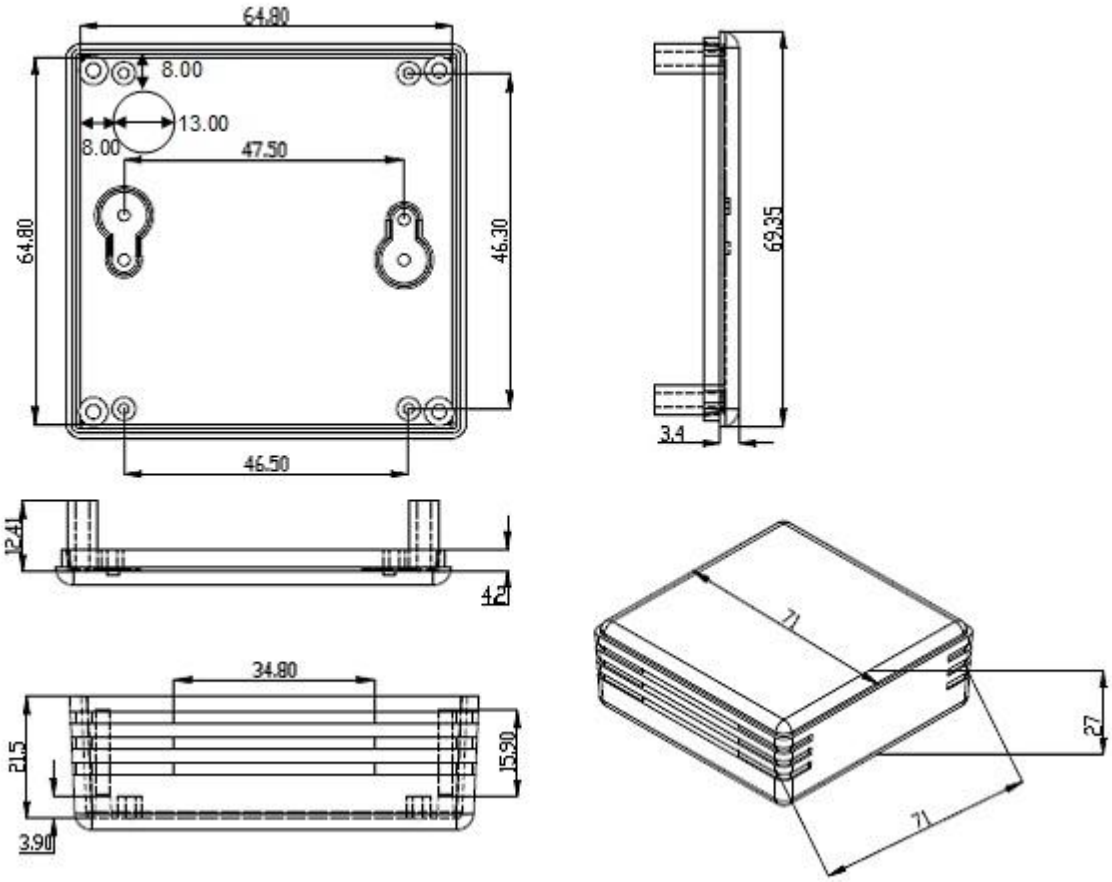

Figure 6.1 Device Dimensions

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7. A.C profile data (Generic HVAC interface)

In this section the *Generic HVAC interface* EEPs (07-20-10 and 07-20-11)) applied to the DK-AC-ENO-1 / 1C are explained. These two EEPs along with the *Room Operating Panel* EEP 07-10-03 can transmit and receive all the AC information.

HVAC Components

ORG = 07 (4 BS)
FUNC = 20 HVAC Components

EEP: 07-20-10

TYPE = 10 Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off

EEP for Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off: With this EEP plus the already existing EEP 07-10-03 and 07-20-11 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

Teach-In
The teach-in telegram has the same structure as a normal 4BS telegram.
see. Standardization EnOcean Equipment Profiles (EEP) V2.0
The actuator expected after successful teach-in a 4BS teach-in acknowledge and use the following structure.

DB_3								DB_2								DB_1								DB_0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Profile								Type								Manufacturer ID								LRN Type	EEP result	LRN result	TA	LRN	d.c	d.c	d.c

DB_3: Function, same as teach-in telegram heating valve = 20
DB_2: type, same as teach-in telegram actuator = 01
DB_1: Intesis Software ID:19
DB_0.BIT_7: LRN TYPE = 0b1 (type 1 with profile, manufacturer Id)
DB_0.BIT_6: EEP result; EEP supported = 0b1, EEP not supported = 0b0
DB_0.BIT_5: LRN result; ID stored = 0b1, ID deleted (not stored) = 0b0
DB_0.BIT_4: TA= teach in answer = 0b1
DB_0.BIT_3: LRN Learn button 0b0 Teach-in telegram
0b1 Data telegram
DB_0.BIT_2: not used
DB_0.BIT_1: not used
DB_0.BIT_0: not used

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EEP: 07-20-10 (CONTINUATION)

DATA BYTES

Receive mode: Commands received by the HVAC interface

DB_3	Mode[1]	0	Auto
		1	Heat
		3	Cool
		9	Fan only
		14	Dehumidification (dry)
		33 … 254	reserved
		255	N/A[2]
DB_2 [7 .. 4]	Vane position	0 .. 9	Not supported
		7 .. 10	Reserved
		11	Vertical swing
		12	Horizontal swing
		13	Horizontal and vertical swing
		14	Stop swing
		15	N/A
DB_2 [3 .. 0]	Fan Speed	0	Auto
		1	Low
		2	Mid1
		3	Mid2
		4	Mid3
		5	High
		6..14	Sets the value to High
		15	N/A
DB_1	Not used		
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0_DB2+ DB_0_DB1:	Room occupancy	00:	Occupied
		01:	StandBy (waiting to perform action)
		10:	Unoccupied (action performed)
		11:	Off (no occupancy and no action)
DB_0.BIT_0)	On/Off	0b0	Off turns the unit to Off
		0b1	On

[1] Other modes don't apply to this AC interface. If any other received it would behave as if it had received and N/A
[2] N/A stands for No Action. It keeps the actual value of the parameter

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EEP: 07-20-10 (CONTINUATION)

Transmit mode: Commands sent by the HVAC interface

DB_3	Mode[1]	1	Heat
		3	Cool
		9	Fan only
		14	Dehumidification (dry)
		31	Auto Heat[2]
		32	Auto Cool[2]
		33 … 254	reserved
		255	N/A[3]
DB_2 [7 .. 4]	Vane position	0 .. 9	Not supported
		7 .. 10	Reserved
		11	Vertical swing
		12	Horizontal swing
		13	Horizontal and vertical swing
		14	Stop swing
		15	N/A
DB_2 [3 .. 0]	Fan Speed	0	Auto
		1	Low
		2	Mid1
		3	Mid2
		4	Mid3
		5	High
		6..14	Not used
		15	N/A
DB_1	Not used		
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0_DB2+ DB_0_DB1:	Room occupancy	00:	Occupied
		01:	StandBy (waiting to perform action)
		10:	Unoccupied (action performed)
		11:	Off (no occupancy and no action)
DB_0.BIT_0)	On/Off	0b0	Off
		0b1	On

[1] Other modes don't apply to this AC interface. It will only send this ones
[2] Auto transmission modes
[3] N/A: it is send when the actual value of the parameter is not known

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ORG = 07 (4 BS)
FUNC = 20 HVAC Components

EEP: 07-20-11

TYPE = 11 Generic HVAC interface – Error control: AC Error code, Error states and disablements

EEP for Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off: With this EEP plus the already existing EEP 07-10-03 and 07-20-10 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

Teach-In

The teach-in telegram has the same structure as a normal 4BS telegram.
see. Standardization EnOcean Equipment Profiles (EEP) V2.0
The actuator expected after successful teach-in a 4BS teach-in acknowledge and use the following structure.

DB_3								DB_2								DB_1								DB_0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Profile								Type								Manufacturer ID								LRN Type	EEP result	LRN result	TA	LRN	d.c	d.c	d.c

DB_3: Function, same as teach-in telegram heating valve = 20
DB_2: type, same as teach-in telegram actuator = 01
DB_1: Intesis Software ID:19
DB_0.BIT_7: LRN TYPE = 0b1 (type 1 with profile, manufacturer Id)
DB_0.BIT_6: EEP result; EEP supported = 0b1, EEP not supported = 0b0
DB_0.BIT_5: LRN result; ID stored = 0b1, ID deleted (not stored) = 0b0
DB_0.BIT_4: TA= teach in answer = 0b1
DB_0.BIT_3: LRN Learn button 0b0 Teach-in telegram
0b1 Data telegram
DB_0.BIT_2: not used
DB_0.BIT_1: not used
DB_0.BIT_0: not used

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EEP: 07-20-11 (CONTINUATION)

DATA BYTES

Receive mode: Commands received by the HVAC interface

DB_3	not used		
DB_2	not used		
DB_1 [7 .. 1]	not used		
DB_1.BIT_0	External disablement	0b0	Not disabled
		0b1	Disabled
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0.BIT_2	Disable remote controller		Not supported
DB_0.BIT_1	Window contact	0b0	Windows opened
		0b1	Windows closed
DB_0.BIT_0	not used		

Transmit mode: Commands sent by the HVAC interface

DB_3	Error code HI		Generated by A.C (Table 10.1)
DB_2	Error code LO		Generated by A.C (Table 10.1)
DB_1 [7 .. 4]	Reserved	0x00	
DB_1.BIT_3	Other disablement	0b0	Not Used
DB_1.BIT_2	Window contact disablement	0b0	Not disabled
		0b1	Disabled
DB_1.BIT_1	Key card disablement	0b0	Not disabled
		0b1	Disabled
DB_1.BIT_0	External disablement	0b0	Not disabled
		0b1	Disabled
DB_0.BIT_3	Learn Button	0b0	Teach-in telegram
		0b1	Data telegram
DB_0.BIT_2	Remote controller Disablement	0b0	Not supported
DB_0.BIT_1	Window contact	0b0	Windows opened
		0b1	Windows closed
DB_0.BIT_0	Alarm State	0b0	OK
		0b1	Error

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8. AC Unit Types compatibility

The AC indoor unit models specified in Table 8.1 are the ones compatible with the devices DK-AC-ENO-1 / 1C.

Prefix (first part) of the AC indoor unit model number	Line
FTXR28	Ururu Sarara
FTXR42	
FTXR50	
CTXU25	Ururu Sarara Multi
CTXU35	
CTXU42	
CTXU50	
FTXG25	Wall UX1/Emura
FTXG35	
CTXG-50	
FTXS20	Wall (Also FTKS)
FTXS25	
FTXS35	
FTXS42	
FTXS50	
FTXS60	
FTXS71	
FVXS25	Floor
FVXS35	
FVXS50	
FLXS25	Floor -Ceiling
FLXS35	
FLXS50	
FDXS25	Duct Low Silhouette
FDXS35	
FDXS50	
FDXS60	

Table 8.1 AC Unit Types compatibility

Any AC unit with a model number not specified in this list (in column *Prefix*), might not be compatible with the interface and therefore can't be used without previously checking the model compatibility, contact your DK-AC-ENO-1 / 1C supplier for this.

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9. Available features for each type of Daikin AC Unit.

Supported Daikin AC unit models will differ from each other in the features they offer.This list shows the available features in each supported Daikin AC type.

Type:1	CONVENTIONAL	Set point temperature			
Swing	Humidification Mode	Heat	Cool	Dry	Auto
Vertical	Not Available	30..10	32..18	32..18	30..18

Type:2	URURU SARARA	Set point temperature			
Swing	Humidification Mode	Heat	Cool	Dry	Auto
Vertical, Horizontal	Not Available	30..10	32..18	32..18	30..18

Type:3	UX1 SERIES	Set point temperature			
Swing	Humidification Mode	Heat	Cool	Dry	Auto
Vertical, Horizontal	Not Available	30..10	32..18	32..18	30..18

Type:4	CONCEALED CEILING	Set point temperature			
Swing	Humidification Mode	Heat	Cool	Dry	Auto
Not Available	Not Available	30..10	32..18	32..18	30..18

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10. Error Codes

Error Code	Error in Remote Controller	Error category	Error Description
0	N/A	DK-AC-ENO-1 / 1C	No active error
17	A0	Indoor Unit	External protection devices activated
18	A1		Indoor unit PCB assembly failure
19	A2		Interlock error for fan
20	A3		Drain level system error
21	A4		Temperature of heat exchanger (1) error
22	A5		Temperature of heat exchanger (2) error
23	A6		Fan motor locked, overload, over current
24	A7		Swing flap motor error
25	A8		Overcurrent of AC input
26	A9		Electronic expansion valve drive error
27	AA		Heater overheat
28	AH		Dust collector error / No-maintenance filter error
30	AJ		Capacity setting error (indoor)
31	AE		Shortage of water supply
32	AF		Malfunctions of a humidifier system (water leaking)
33	C0		Malfunctions in a sensor system
36	C3		Sensor system of drain water error
37	C4		Heat exchanger (1) (Liquid pipe) thermistor system error
38	C5		Heat exchanger (1) (Gas pipe) thermistor system error
39	C6		Sensor system error of fan motor locked, overload
40	C7		Sensor system of swing flag motor error
41	C8		Sensor system of over-current of AC input
42	C9		Suction air thermistor error
43	CA		Discharge air thermistor system error
44	CH		Contamination sensor error
45	CC		Humidity sensor error
46	CJ		Remote control thermistor error
47	CE		Radiation sensor error
48	CF		High pressure switch sensor
49	E0	Outdoor Unit	Protection devices activated
50	E1		Outdoor uni9t PCB assembly failure
52	E3		High pressure switch (HPS) activated
53	E4		Low pressure switch (LPS) activated
54	E5		Overload of inverter compressor motor
55	E6		Over current of STD compressor motor
56	E7		Overload of fan motor / Over current of fan motor
57	E8		Over current of AC input
58	E9		Electronic expansion valve drive error
59	EA		Four-way valve error
60	EH		Pump motor over current
61	EC		Water temperature abnormal
62	EJ		(Site installed) Protection device activated
63	EE		Malfunctions in a drain water
64	EF		Ice thermal storage unit error
65	H0		Malfunctions in a sensor system
66	H1		Air temperature thermistor error
67	H2		Sensor system of power supply error
68	H3		High Pressure switch is faulty
69	H4		Low pressure switch is faulty
70	H5		Compressor motor overload sensor is abnormal
71	H6		Compressor motor over current sensor is abnormal
72	H7		Overload or over current sensor of fan motor is abnormal
73	H8		Sensor system of over-current of AC input
74	H9		Outdoor air thermistor system error
75	HA		Discharge air thermistor system error
76	HH		Pump motor sensor system of over current is abnormal
77	HC		Water temperature sensor system error
79	HE		Sensor system of drain water is abnormal
80	HF		Ice thermal storage unit error (alarm)
81	F0		No.1 and No.2 common protection device operates.
82	F1		No.1 protection device operates.
83	F2		No.2 protection device operates
84	F3		Discharge pipe temperature is abnormal
87	F6		Temperature of heat exchanger(1) abnormal
91	FA		Discharge pressure abnormal
92	FH		Oil temperature is abnormally high
93	FC		Suction pressure abnormal
95	FE		Oil pressure abnormal
96	FF		Oil level abnormal
97	J0		Sensor system error of refrigerant temperature

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98	J1		Pressure sensor error
99	J2		Current sensor error
100	J3		Discharge pipe thermistor system error
101	J4		Low pressure equivalent saturated temperature sensor system error
102	J5		Suction pipe thermistor system error
103	J6		Heat exchanger(1) thermistor system error
104	J7		Heat exchanger(2) thermistor system error
105	J8		Oil equalizer pipe or liquid pipe thermistor system error
106	J9		Double tube heat exchanger outlet or gas pipe thermistor system error
107	JA		Discharge pipe pressure sensor error
108	JH		Oil temperature sensor error
109	JC		Suction pipe pressure sensor error
111	JE		Oil pressure sensor error
112	JF		Oil level sensor error
113	L0		Inverter system error
116	L3		Temperature rise in a switch box
117	L4		Radiation fin (power transistor) temperature is too high
118	L5		Compressor motor grounded or short circuit, inverter PCB fault
119	L6		Compressor motor grounded or short circuit, inverter PCB fault
120	L7		Over current of all inputs
121	L8		Compressor over current, compressor motor wire cut
122	L9		Stall prevention error (start-up error) Compressor locked, etc.
123	LA		Power transistor error
125	LC		Communication error between inverter and outdoor control unit
129	P0		Shortage of refrigerant (thermal storage unit)
130	P1		Power voltage imbalance, open phase
132	P3		Sensor error of temperature rise in a switch box
133	P4		Radiation fin temperature sensor error
134	P5		DC current sensor system error
135	P6		AC or DC output current sensor system error
136	P7		Total input current sensor error
142	PJ		Capacity setting error (outdoor)
145	U0	System	Low pressure drop due to insufficient refrigerant or electronic expansion valve error, etc.
146	U1		Reverse phase, Open phase
147	U2		Power voltage failure / Instantaneous power failure
148	U3		Failure to carry out check operation, transmission error
149	U4		Communication error between indoor unit and outdoor unit, communication error between outdoor unit and BS unit
150	U5		Communication error between remote control and indoor unit / Remote control board failure or setting error for remote control
151	U6		Communication error between indoor units
152	U7		Communication error between outdoor units / Communication error between outdoor unit and ice thermal storage unit
153	U8		Communication error between main and sub remote controllers (sub remote control error) / Combination error of other indoor unit / remote control in the same system (model)
154	U9		Communication error between other indoor unit and outdoor unit in the same system / Communication error between other BS unit and indoor/outdoor unit
155	UA		Combination error of indoor/BS/outdoor unit (model, quantity, etc.), setting error of spare parts PCB when replaced
156	UH		Improper connection of transmission wiring between outdoor and outdoor unit outside control adaptor
157	UC		Centralized address duplicated
158	UJ		Attached equipment transmission error
159	UE		Communication error between indoor unit and centralized control device
160	UF		Failure to carrey out check operation Indoor-outdoor, outdoor-outdoor communication error, etc.
209	60	Others	All system error
210	61		PC board error
211	62		Ozone density abnormal
212	63		Contamination sensor error
213	64		Indoor air thermistor system error
214	65		Outdoor air thermistor system error
217	68		HVU error (Ventiair dust-collecting unit)
219	6A		Dumper system error
220	6H		Door switch error
221	6C		Replace the humidity element
222	6J		Replace the high efficiency filter
223	6E		Replace the deodorization catalyst
224	6F		Simplified remote controller error
226	51		Fan motor of supply air over current or overload
227	52		Fan motor of return air over current / Fan motor of return air overload
228	53		Inverter system error (supply air side)
229	54		Inverter system error (return air side)
241	40		Humidifying valve error
242	41		Chilled water valve error
243	42		Hot water valve error
244	43		Heat exchanger of chilled water error
245	44		Heat exchanger of hot water error
258	31		The humidity sensor of return air sensor
259	32		Outdoor air humidity sensor error
260	33		Supply air temperature sensor error

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261	34		Return air temperature sensor error
262	35		Outdoor air temperature sensor error
263	36		Remote controller temperature sensor error
267	3A		Water leakage sensor 1 error
268	3H		Water leakage sensor 2 error
269	3C		Dew condensation error
339	M2		Centralized remote controller PCB error
345	M8		Communication error between centralized remote control devices
347	MA		Centralized remote control devices inappropriate combination
349	MC		Centralized remote controller address setting error
65535	N/A	DK-AC-ENO-1 / 1C	Error in the communication of DK-AC-KNX-1 device with the AC unit

Table 10.1 Error codes

☞ In case you detect an error code not listed, contact your nearest Daikin technical support service.

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11. EnOcean Interoperability

In this section there is a list of the allowed transmission and reception EEP

EEP Tx	EEP [1] description
[05-02-01]	Light and Blind Control – Application Style 1
[07-02-05]	Temperature Sensor. Range 0°C to +40°C
[07-10-01]	Temperature Sensor; Set Point, Fan Speed and Occupancy Control
[07-10-03]	Temperature Sensor; Set Point Control
[07-20-10]	HVAC Components. Generic HVAC interface. Functions: Mode, vane position, fan speed, sensors and on/off
[07-20-11]	HVAC Components. Generic HVAC interface. Functions: Error control: AC Error code, Error states and disablements

Table 11.1 Allowed transmission (Tx) EEP

EEP Rx	EEP description
[05-02-xx]	Rocker Switch, 2 Rocker
[05-03-xx]	Rocker Switch, 4 Rocker
[05-04-01]	Key Card Activated Switch
[06-00-01]	Single Input Contact
[07-02-05]	Temperature Sensor. Range 0°C to +40°C
[07-02-06]	Temperature Sensor. Range +10°C to +50°C
[07-07-01]	Occupancy Sensor
[07-08-01]	Light, Temperature & Occupancy Sensor
[07-08-02]	Light, Temperature & Occupancy Sensor
[07-10-01]	Temperature Sensor; Set Point, Fan Speed and Occupancy Control
[07-10-02]	Temperature Sensor; Set Point, Fan Speed and Day/Night Control
[07-10-03]	Temperature Sensor; Set Point Control
[07-10-04]	Temperature Sensor; Set Point and Fan Speed Control
[07-10-05]	Temperature Sensor; Set Point and Occupancy Control
[07-10-06]	Temperature Sensor; Set Point and Day/Night Control
[07-10-07]	Temperature Sensor; Fan Speed Control
[07-10-08]	Temperature Sensor; Fan Speed and Occupancy Control
[07-10-09]	Temperature Sensor; Fan Speed and Day/Night Control
[07-10-0A]	Temperature Sensor, Set Point Adjust and Single Input Contact
[07-10-0B]	Temperature Sensor and Single Input Contact
[07-10-0C]	Temperature Sensor and Occupancy Control
[07-10-0D]	Temperature Sensor and Day/Night Control
[07-10-10]	Temperature and Humidity Sensor; Set Point and Occupancy Control
[07-10-11]	Temperature and Humidity Sensor; Set Point and Day/Night Control
[07-10-12]	Temperature and Humidity Sensor; Set Point Control
[07-10-13]	Temperature and Humidity Sensor; Occupancy Control
[07-10-14]	Temperature and Humidity Sensor; Day/Night Control
[07-20-10]	HVAC Components. Generic HVAC interface. Functions: Mode, vane position, fan speed, sensors and on/off
[07-20-11]	HVAC Components. Generic HVAC interface. Functions: Error control: AC Error code, Error states and disablements
[07-30-02]	Digital Input. Single Input Contact

Table 11.2 Allowed reception (Rx) EEP

[1] EnOcean Equipment Profiles (EEP) V2.0 and v2.1

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12. Regulations and standards

CE conformity:

R&TTE EU-directive on Radio and Telecommunications Terminal Equipment

The general registration for the radio operation is valid for all EU countries as well as for Switzerland.

Standards:

UNE-EN 50491-3:2010
UNE-EN 60950-1:2007
UNE-EN 61000-6-2:2006
UNE-EN 61000-6-3:2007

FCC ID: SZV-STM300C
IC: 5731A-STM300C

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications made to this equipment not expressly approved by Intesis Software may void the FCC authorization to operate this equipment.

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